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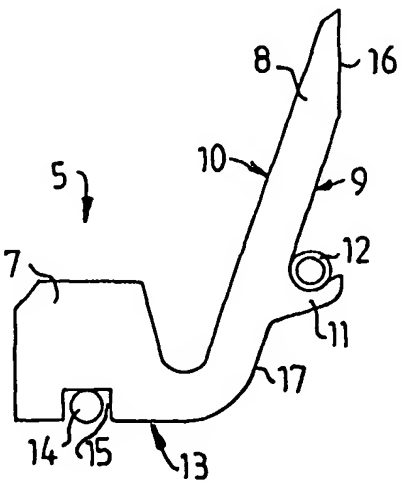
(54) Title: SHAFT SEAL WITH ELASTIC SEALING LIP



(57) Abstract: The invention relates to a seal of the type V-ring. The seal comprises a body (7) with an inner side (13) for abutting, for example, a rotary shaft (1). The seal further comprises a lip (8) with a rear side (10) and a front side (9) with a lower portion (1/9 and an upper portion, the sealing surface (16). The sealing surface is intented to abut a surface rotary in relation to the seal (5), against which surface it is intended to seal. In order to prevent the seal (5) from being broken down by aggressive medium, it is made of PTFE. A resilient ring element (12) is provided to act on the lip (8) with a force, which results in that the sealing surface (16) will move in the direction to the surface it is intended to seal against. The resilient ring element (12) further is arranged so that it cannot come into contact with the aggressive medium.

Shaft seal with elastic sealing lip.

This invention relates to a sealing of the type V-ring.

A V-ring can be used for sealing at a cylindric rotary body. This cylindric body can be, for example, a shaft for a roll in a dewatering means for dewatering material suspensions. Such a dewatering means can comprise two co-acting cylindric rotary rolls, at least one of which is liquid permeable. The rolls form between themselves a nip, through which the material suspension is intended to pass while simultaneously being dewatered. The material suspension usually passes through the nip upward from below.

The material suspension can be, for example, a pulp suspension, and the dewatering means then can be a washing press or a dewatering press.

Hereinafter a dewatering means according to known art will be described where both rolls are liquid permeable. The rolls are formed with liquid permeable shell surfaces, which consist of a perforated metal sheet attached on a roll body.

The rolls are rotary on two parallel shafts. The material suspension is supplied to the means so that by the rotation of the rolls it is moved upward from below through the nip whereat compression and dewatering of the material to the desired dry matter content takes place.

After the nip the material is picked-up from the rolls by means of a doctor blade device. The material is then transported away from the dewatering means.

The liquid (filtrate) passing through the shell surface is conducted away via channels inside the shell surface to the ends of the rolls and further away from the dewatering means.

The roll arrangement, of course, can also be formed so, that the material suspension by the rotation of the rolls is moved through the nip downward from above.

Means of the type referred to above are described, for example, in SE 501 710 and WO 98/54401.

Each shaft is mounted in bearings, and the bearing is located in a bearing housing, which is filled with oil. In order to seal at the shaft between the oil-filled space of the bearing housing and the space holding the filtrate, a seal of the type V-ring of rubber is located in such a manner, that it rotates with the shaft and has a lip resting against the wall of the bearing housing.

It is very important that no filtrate can penetrate into the bearing, which would be subject to great damage and in the worst case breaks down.

At such means there is the problem that the V-ring is destroyed and requires frequent exhange. This causes very expensive shutdowns.

The present invention provides a seal with considerably longer service life than seals of the type V-ring according to known art.

The service life of the rubber is shortened both by high temperature and low pH. The combination of low pH and high temperature is highly destructive. In a dewatering means of the kind described the filtrate has low pH and high temperature. In the extreme case the temperature can be abut 90° C and the pH about 2.

The seal according to the invention is of the type V-ring and formed of PTFE, which advantageously is reinforced, for example with carbon. PTFE withstands the acid envionment, but is not as elastic as rubber. In order to render the seal elastic a spring is located on the seal in such a manner, that the spring does not get into contact with the filtrate, because it should not be exposed to the agressive environment of the filtrate.

Besides, fibers in the filtrate easily adhere to the spring and can thereby deteriorate its functioning.

The spring is arranged so that it affects the lip of the seal to be pressed against the surface, against which it is intended to seal, in this case the wall of the bearing housing.

The characterizing features of the invention are apparent from the attached claims.

A preferred embodiment is described in the following, with reference to the accompanying drawing, in which

Fig. 1 shows partly a shaft portion in a dewatering means, and

Fig. 2 shows the seal.

The dewatering means as such will not be described in detail, because it is known a.o. through the specifications referred to above.

Fig. 1 shows part of a shaft portion in a dewatering means of the kind described above. Only the upper half of a shaft 1 is shown, because the means is substantially symmetric.

In a bearing housing 2 on the shaft 1 a bearing 3 is located. The bearing housing 2 is located in a hole in a wall 20, which separates a medium space 6 from the outside of the dewatering means, i.e. the atmosphere 21.

The medium space 6 contains the filtrate, which by means of the dewatering means was pressed out of a pulp suspension. The filtrate contains also a certain amount of fibers, which at the dewatering followed along with the filtrate.

The bearing housing, together with the shaft, encases a bearing space 18, in which the bearing 3 is located. The bearing space 18 suitably is filled with oil, but can also, for example, be filled with fat or air. A radial seal 19 seals between the bearing space 18

and atmosphere 21. The bearing housing 2 has against the medium space 6 for the filtrate a bearing housing wall 4, against which a seal 5 of the type V-ring acts in order to seal between the bearing space 18 and medium space 6.

The V-ring 5 in Fig. 2 comprises a body 7 with an inner side 13, which abuts the shaft 1. The V-ring is arranged to rotate with the shaft 1 at the rotation thereof. In the Figure also an O-ring 14 is located in a recess 15 in the body 7 at the inner side 13 thereof, in such a manner, that the O-ring 14 in mounted state of the V-ring 5 on the shaft 1 is encased by the body 7 and shaft 1. It is the function of the O-ring to ensure that neither oil nor filtrate can pass between the V-ring 5 and shaft 1. Instead of the O-ring also other types of seals can be used, for example a sealing liquid. The decision which type of seal is suitable in this position, depends on the medium used, and in certain cases no seal is needed at all.

The V-ring 5 comprises a lip 8 with a rear side 10 and a front side 9, where the front side 9 is divided into an upper portion, the sealing surface 16, and a lower portion 17. The sealing surface 16 acts against the bearing housing wall 4. On the lower portion 17 a holding means 11 is located, which in this case is a shelf. On the shelf 11 a resilient ring element 12 is located, which in this case is a ring-shaped helical spring. Also other resilient elements can, of course, be used, for example an O-ring.

The spring 12 is arranged on the shelf 11 in such a way, that it acts with a pulling force on the lip 8 and thereby pulls the lip 8 against the bearing housing wall 4, so that its sealing surface 16 can abut the bearing housing wall 4.

(PTFE is not elastic, but the material "floats" in the direction of the acting force. The result, however, will be at the final end the same as in the case of an elastic material, but with a certain delay compared with an elastic material).

At the rotation of the shaft 1 the V-ring 5 follows along in the rotation, and the sealing surface 16 of the lip abuts (seals against) the non-rotating bearing housing wall 4. At the V-ring 5 the flow will then be such that the oil tends to flow past between the lip and

bearing housing wall. 4. Thus, no filtrate can get into the bearing housing 2 and contact the spring 12 or bearing 3.

The resilient ring element 12 can also be arranged in a different way, but so that it affects the lip 8 with a force, which results in that the sealing surface 16 will move in the direction to the surface it is intended to seal against, which means that it is pressed against the bearing housing wall 4.

The spring 12 must not come, either, into contact with the filtrate in the medium space 6, but shall be concealed, seen from rear side 10 of the lip 8.

The spring 12, thus, can also be located entirely enclosed in the lip 8.

It is, of course, possible to arrange advantageously more seals, suitably radial seals, between the bearing and the space containing the filtrate.

The V-ring can, of course, advantageously also be used in other means where it shall seal against an aggressive enviroment, and with still greater advantage in cases when it shall seal against an aggressive medium, where the medium in addition contains particles, such as fibers.

The device where the V-ring shall be used can, for example, also be formed so that the shaft, on which the V-ring is located, is intended to be non-rotating, and the surface, against which the lip is intended to act, is rotary.

The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the claims with reference to description and Figures.

Claims

1. A seal comprising a body (7) with an inner side (13) for abutting, for example, a rotary shaft (1), and a lip (8) comprising a rear side (10) and a front side (9) with a lower portion (17) and an upper portion, the sealing surface (16), which is intended to abut a surface rotary in relation to the seal (5), against which it shall seal, **characterized in** that the seal (5) is made of PTFE, and that a resilient ring element (12) is provided to act on the lip (8) with a force, which results in that the sealing surface (16) will move in the direction to the surface it is intended to seal against, and where the resilient ring element (12) is located so that it is concealed, seen from the rear side (10) of the lip (8).

2. A seal as defined in claim 1, **characterized in** that the seal (5) on the lower portion (17) of the front side of the lip has a holding means (11), on which the resilient ring element (12) is located.

3. A seal as defined in any one of the preceding claims, **characterized in** that the resilient ring element (12) is a ring-shaped helical spring.

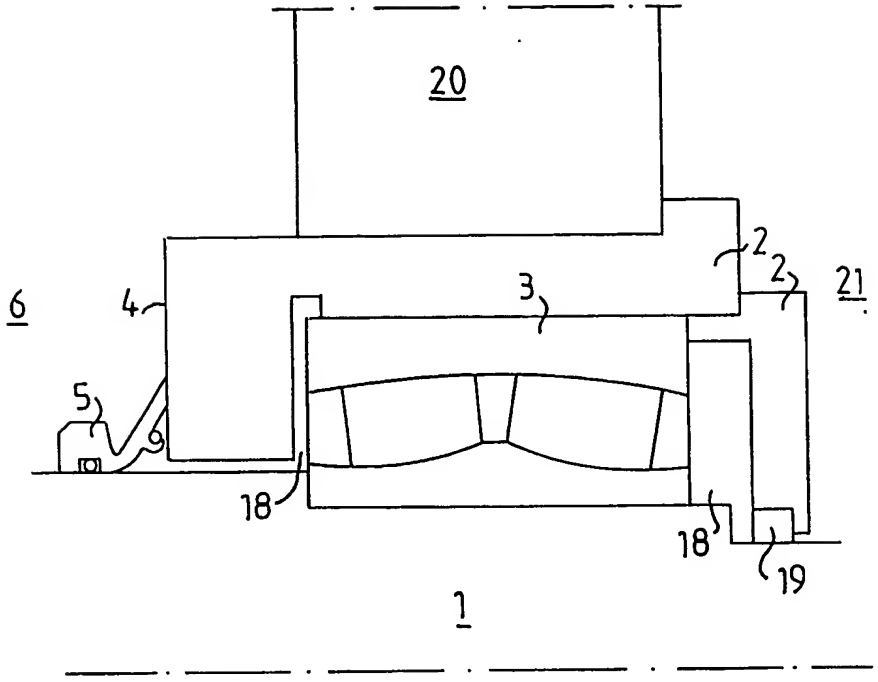


FIG.1

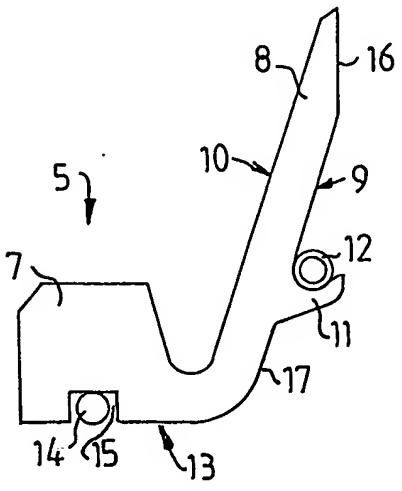


FIG.2

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16J 15/32
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3401947 A (R.D. RUMSEY), 17 Sept 1968 (17.09.68), column 3, line 39 - line 41, figure 2	1-3
A	US 4311316 A (CATHER, JR.), 19 January 1982 (19.01.82), abstract, fig.	1-3
A	US 4544164 A (CUIJPERS), 1 October 1985 (01.10.85), figure 1, abstract	1-3
A	US 4866827 A (BENFER ET AL), 19 Sept 1989 (19.09.89), abstract, fig.	1-3

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 June 2002	17 -06- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Daniel Aberg / MRo Telephone No. +46 8 782 25 00

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

01/05/02

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